IN THE CLAIMS:

1. (Currently Amended) A method of cryogenically cooling a superconducting magnet surrounded by liquid helium at a temperature of below 4.2 K within an inner chamber of a cryogenic vessel, the method comprising:

supplying current to the magnet by way of a removable current lead extending through a supply passage passing through the wall of the vessel in order to initiate superconducting current flow in the magnet ;

stopping the supply of current to the magnet whilst the superconducting current flow persists in the magnet;

withdrawing the current lead from the supply passage;

after an extended period of superconducting current flow in the magnet without stopping such superconducting current flow, ~~supplying by way of a valve~~ supplying by way of a valve, liquid helium at a temperature of about 4.2 K to an upper part of the inner chamber above the magnet such that the magnet is still surrounded by liquid helium at a temperature of below 4.2 K;

stopping the supply of liquid helium to the inner chamber by closing the valve; and

cooling the liquid helium in the upper part of the inner chamber to a temperature of below 4.2 K by reducing the pressure in the upper part of the inner chamber by pumping whilst the valve remains closed.

2. (Previously Presented) The method according to claim 1, wherein the magnet is cooled by the liquid helium within the inner chamber to a temperature of below 2.5 K.

3. (Previously Presented) The method according to claim 2, wherein the magnet is cooled by the liquid helium within the inner chamber down to a temperature below the lambda point (2.17 K).

4. (Canceled)

5. (Previously Presented) The method according to claim 1, wherein the valve has a

removable actuating shaft, and the actuating shaft is removed from the valve after the supply of liquid helium to the inner chamber has stopped, in order to limit heat conduction during further operation.

6. (Previously Presented) The method according to claim 3, wherein the current is supplied to the magnet by way of the removable current lead having a connector part at one end adapted to be connected to a connector part provided on the magnet internally of the inner chamber in order to supply current from an external current source to the magnet by way of the lead extending through the supply passage, and to be subsequently detachable from the connector part to permit withdrawal of the lead from the supply passage so as to limit heat conduction along the supply passage during further operation.

7. (Previously Presented) The method according to claim 6, wherein the inner chamber is vented with helium gas without warming the liquid helium within the inner chamber to any substantial extent to permit the lead to be withdrawn from the supply passage.

8. (Previously Presented) The method according to claim 7, wherein the level of the liquid helium in the inner chamber is monitored during operation so as to provide an indication of the need to supply liquid helium at a temperature of about 4.2 K to the upper part of the inner chamber when the level of the liquid helium in the inner chamber has fallen below a predetermined level.

9-10 (Canceled)

11. (Previously Presented) The method according to claim 8, wherein the magnet is annular and is disposed with its axis vertical within a vertical cryogenic vessel.

12. (Canceled)

13. (Currently Amended) A superconducting magnet system comprising:

a cryogenic vessel;

a superconducting magnet contained in an inner chamber within the vessel to be cooled

by liquid helium at a temperature of below 4.2 K within the inner chamber;

an outer chamber surrounding the inner chamber, the outer chamber holding a supply of liquid helium at a temperature of about 4.2K,

a removable current lead, which supplies current to the magnet via a supply passage extending through the wall of the vessel in order to initiate superconducting current flow in the magnet, and subsequently stopping the supply of current to the magnet whilst the superconducting current flow persists in the magnet and the current lead is withdrawn from the supply passage;

a valve which supplies, after an extended period of superconducting current flow in the magnet and without stopping the superconducting current flow, liquid helium at a temperature of about 4.2 K from the outer chamber to an upper part of the inner chamber above the magnet where the magnet is surrounded by liquid helium at a temperature of below 4.2 K, and subsequently stops the supply of liquid helium to the inner chamber by closing the valve; and

cooling means, which cools the liquid helium in the upper part of the inner chamber to a temperature of below 4.2 K by reducing the pressure in the upper part of the inner chamber by pumping whilst the valve remains closed.

14. (Canceled)

15. (Previously Presented) The system according to claim 13, wherein the valve has a removable actuating shaft, which is removable from the valve after the supply of liquid helium to the inner chamber has stopped in order to limit heat conduction during further operation.

16. (Previously Presented) The system according to claim 13, wherein

the removable current lead has a connector part placed at one end of the lead, and the magnet has a connector part placed within the inner chamber in order to supply current from an external current source to the magnet via the lead through the supply passage to initiate superconducting current flow in the magnet when the connector parts are connected, and with the superconducting current flow persisting in the magnet, to permit withdrawal of the lead from the supply passage when the connector parts are separated so as to limit heat conduction along the supply passage during further operation of the system.

17. (Previously Presented) The system according to claim 16, further comprising venting means, which vents the inner chamber with helium gas without warming the liquid helium within the inner chamber to any substantial extent to permit the lead to be withdrawn from the supply passage.

18. (Previously Presented) The system according to claim 17, further comprising monitoring means, which monitors the level of the liquid helium in the inner chamber during operation and provides an indication of the need to supply liquid helium at a temperature of about 4.2 K to the upper part of the inner chamber when the level of the liquid helium in the inner chamber has fallen below a predetermined level.

19. (Previously Presented) The system according to claim 18, wherein the magnet is annular and is disposed with its axis horizontal within a horizontal cryogenic vessel.

20. (Previously Presented) The system according to claim 19, wherein the valve is connected to a source of liquid helium external to the cryogenic vessel.

21. (Previously Presented) The system according to claim 18, wherein the magnet is annular and is disposed with its axis vertical within a vertical cryogenic vessel.

22. (Previously Presented) The system according to claim 21, wherein the valve is connected to an outer chamber containing liquid helium at a temperature of about 4.2 K, the outer chamber surrounding the inner chamber and being contained within the cryogenic vessel.

23. (Previously Presented) The system according to claim 22, wherein a gas-cooled shield is provided within the vessel so as to surround the inner chamber.

24. (Previously Presented) The system according to claim 23, wherein an annular liquid nitrogen reservoir is provided within the vessel so as to surround the inner chamber.

25-27 (Canceled)

28. (New) A method of cryogenically cooling a superconducting magnet surrounded by liquid helium at a temperature of below 4.2 K within an inner chamber of a cryogenic vessel, said magnet being annular disposed with its axis horizontal within a horizontal cryogenic vessel. the method comprising:

at least, at intervals, cooling the liquid helium to the temperature below 4.2 K by pumping the inner chamber to a pressure below atmospheric pressure,

supplying current to the magnet by way of a removable current lead extending through a supply passage passing through the wall of the vessel in order to initiate superconducting current flow in the magnet ;

stopping the supply of current to the magnet whilst the superconducting current flow persists in the magnet;

withdrawing the current lead from the supply passage;

after an extended period of superconducting current flow in the magnet without stopping such superconducting current flow, ascertaining the need to supply liquid helium at a temperature of about 4.2 K to the upper part of the inner chamber when the level of the liquid helium in the inner chamber has fallen below a predetermined level;

stopping the pumping of the inner chamber and allowing the pressure of the inner chamber to increase to atmospheric pressure;

supplying from a source external to the cryogenic vessel, by way of a valve, liquid helium at a temperature of about 4.2 K to an upper part of the inner chamber above the magnet such that the magnet is still surrounded by liquid helium at a temperature of below 4.2 K;

stopping the supply of liquid helium to the inner chamber by closing the valve; and

cooling the liquid helium in the upper part of the inner chamber to a temperature of below 4.2 K by reducing the pressure in the upper part of the inner chamber by pumping whilst the valve remains closed.